FUNNY ENERGY STORIES

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Abstract

This paper describes a series of hilarious true stories that demonstrate how easy it often is to save huge amounts of energy by relatively small and simple operating changes. The savings in most of these stories were documented by seeing the actual electric and gas bills go down. All of the situations were apparently invisible to the building operating and maintenance staffs, but readily apparent to the severely trained energy engineer. Stories also include a few where a well meaning, but misunderstanding, operating person inadvertently defeated "the best laid plans of mice and men" resulting in huge extra costs on the energy bills. The series of stories illustrates the importance of actually going out to look at the equipment using the energy and talking to the actual people operating them.

Standard Routine

Generally my visits originate with a call from a customer who is complaining that his electric or gas bill is too high, or just wants help finding what he can do to reduce his bills. I go visit and ask them to show me what uses the energy there. When I see something odd, I ask, "Why is this like that?" Often what we find together is embarrassing to them, so I try not to make a big deal and don't take pictures. I just point out how much they can reduce their bill by fixing it, then go on my way.

Always been cold

The new manager said that the grocery store has always been cold for the 10 years that he has worked there, and he wants to finally do something about it. He wondered what his savings might be if he added a bunch of insulation under the ceiling.

First I borrowed a ladder and checked a couple diffusers. There was just a trickle of warm air coming out. I told him that this might be his problem, not the insulation. The roof already seemed to have plenty of insulation. I asked to see the heating unit.

We took the ladder to the back of the store and he pointed up. His office was kind of a box built in the back of the store. On top, wedged between pipes and structural was the unit. I had to climb the ladder, squeezing between the pipes and the ladder, not easy for a fat guy like me.

When I could reach the unit, I opened the access door to the mixed air chamber. Right way, looking up into the unit, you could see sky! The manager could see it too, from the floor. I found the damper actuator linkage and mentioned to the manager that there was no actuator, and there should have been.

I explained that here in the middle of winter, he was pulling in 100% outside air, and probably only needed about 10%. This could be part of the problem. He turned red, looking real embarrassed, and said " I guess I should have looked up there before calling you.

I then crawled around to the back and opened the access door to the heating coils. First I got a blast of air with a lot of dust, then I looked in and saw that he had two coils. The first was a heat recovery coil for preheating the air using the superheated refrigerant from his refrigeration compressors. This one was so covered with dirt and lint that it looked like it had a fur coat. I could not clearly see the electric resistance coil behind it and there was not another access door to easily get at it.

I climbed down and explained that not only was very little air getting though, but also he may not be getting much heat recovered from that badly fouled heat recovery coil. I suggested he bring someone in to thoroughly clean both coils and install an actuator for the outside air damper. He apologized again profusely and said he would call today. Their bills did not go down a lot, but the store was much warmer after that.

Not our fault – must be yours!

The angry doctor said that they had changed nothing, so it must be something wrong with our meter that made the bills double. When I got there, he was "too busy" to see me. (I did see him later

hanging out in the lunchroom.) His clinic had formerly been a bank with drive-up windows. As I went around with his office manager, I pointed out how the economizer controls were hanging off the air handlers by their wires, all the programmable thermostats were in bypass, two electric heaters were on in unoccupied spaces, and the heat and the air conditioning were both on simultaneously in the lunch room, where the boss was holding court.

Angry VP

The vice president of a large and prestigious architectural and engineering firm called to complain that the bills in their new facility were twice what their old office was, and even more that those of the previous tenant. Since they were only occupying 1/3 of the space, he could not understand how the electric bills could be so high.

As we walked down the main hallway, I pointed out that all the hallway lights were on, and suggested that when it used to be a Catholic grade school, those frugal old nuns probably seldom turned on all those lights in the daytime. Similarly, we found all the lights on in the unoccupied basement, and in the upper floor areas that were still not occupied. At that point he said, "All right! I get it!" And pushed me out the door.

Chuck Factor

Good old boy Chuck ran the plant successfully for many years. Then the smart aleck utility engineer convinced Chuck's management that they could save a ton of money if they automated. The utility even paid a big rebate for the computer. Chuck didn't like it. Chuck bypassed the fancy new computer and ran the plant as he pleased. We will never know how much money the computer might have saved them.

He said, she said.

The recreation facility had the latest in entertainment technology, but an obsolete non-Y2K building EMS. And the new head of maintenance had no one that could really work it. It could display some equipment readouts, though. That's how we found that the main huge air conditioning unit for the main concourse was in cooling…and heating. Three stages of air conditioning, plus economizer were running, plus one heating coil stage. Turned out that the EMS and the AC were provided by different manufacturers on lowest bid, and did not seem to talk to each other.

Outside air control brick

It was a sunny cold day in Wisconsin, about 10 degrees F. The customer had asked for a routine energy audit. One of the first things you couldn't help but notice was the sun shining in the 15' wide by 30' tall outside air damper. The damper linkage was disconnected and it was being jammed open with a piece of 2"x4" about the size of a brick.

When I got back to the office and ran the numbers for savings for fixing the linkage, it came to about $100,000/yr. I called him right way. He said he would think about it. I called 6 months later to follow-up. He said he was thinking about it. A year later, the same.

Wood wedge chilled water control

This was at a small college in the hills of Tennessee, where the summer cooling season stretches from about March to November. The chilled water and hot water systems were combined into a three-pipe system with a combined return. They would manually try to run the chiller and boiler as little as possible to avoid blending.

When I asked about the wooden wedge between the pneumatic diaphragm and the globe valve on a chilled water control valve, they said it had broken years ago and they did not have money to fix it. So instead, when a teacher calls to say it is to hot, they come over and wiggle it out a bit to give them more chilled water. When it is too cold, they come pound it in a bit.

I really felt for them. They also showed me where the thermostat for one building used to be, and now there were just two wires. When it got hot, they would twist them together, when cold, pull them apart.

Unfortunately, this way it is nearly always too hot or too cold to some degree, so what the are saving on replacement parts, they are certainly paying for over and over in energy.

We can't do setback and deadband!

The mayor and city hall staff had just moved into a new showcase location. Unfortunately, the energy bills were way more than they budgeted for. They called me and asked what should they do. I suggested that they check out the settings of the thermostats and time schedules of the new energy management system to see that nothing was running

more than it should. I also sent them a short letter with a checklist of things to look for.

They invited me to a meeting with their mechanical contractor to talk about my letter. At the meeting, I was confronted by two very angry contractors. They proceeded to explain to me that the air conditioning systems had to run as they are all the time, because one part of one floor ran 24 hours. And they could not change the setpoints of the thermostats from the plus or minus one degree that the client had asked for. Thermostats that were 20' apart with overlapping heat and cooling setpoints were fighting each other. I suggested a 6-degree deadband or more. Then the fire alarm went off and ended the meeting.

A month later, the city hall administrator called to say that the bills were still too high. I reminded him that his contractor said they could not change any of the settings or schedules as I suggested. I got 5 more monthly calls like this.

In the seventh month, I got a call from the contractor who said that they had been ordered by the city to make all those changes and wanted help in determining the effect on the bill. The bill had gone down 28% the first month, compared to an earlier period with similar weather.

We have economizer control!

A small insurance office called to say that he could not understand why his bills were so high. He said he did have economizer control that pulled in fresh air to do most of the cooling in the long cool spring and fall we have in the Pacific Northwest. I borrowed his ladder, which almost reached the roof, and by hanging onto the electrical weatherhead, I pulled myself up onto the roof.

Someone had apparently been doing some roof leak repairs. Rather than installing flashing around the roof curb for the rooftop air conditioner, they had laid the tarpaper right up over the air conditioner and tarred it right over! They had completely covered the outside air intake. Luckily, they did leave the condenser fins and fan exhaust uncovered.

"Open doors if hot"

The school district energy manager took me along to troubleshoot why the little separate gym building for a small school used more gas than the whole rest of the school. As the custodian showed us in, we noticed that the children inside were all playing with their coats on. When we asked about it, the custodian said that it was always very cold in the mornings, but by 9 it was so hot that she had to open the doors.

We could see no thermostats, so we asked about them. The custodian showed us the room where the thermostat was locked up. It was in an unheated, unventilated room, mounted on an uninsulated outside block wall. It had a sign on it that said "Do not adjust thermostat. Open doors if too hot." She then showed us the switch where she turned on the heat at 6 every morning and off at 3 pm.

We next went up on the roof to look at the rooftop heaters. They looked normal, but we saw a large running exhaust. Down below we found a separate exhaust switch that the custodian knew nothing about.

So what was happening was this. The exhaust ran 24 hours a day. With the heat off at night, it got really cold by the next morning. Then when the heat was turned on, it stayed on all day, because no heat ever reached the thermostat until summer. The heat ran continuous all day until it was turned off at 3 pm. Calculations using the gas rating of the units confirmed this operation.

Not long after, the thermostat was moved back into the gym, and the custodian was trained to shut off the exhaust at night.

That can't be!

The building had been recently remodeled to a state of the art, high tech biotechnology center including clean rooms. But the electric bills were way more than budgeted. I offered to work with their technician to go over all of the points on the Energy Management System to see if we could find anything that might help them reduce their bills. We did find two things.

On a day that was about 40 degrees out, the chilled water reset control was calling for 37 degree chilled water. Usually in cool weather I see setpoints in the 50's. We looked at all the zones calling for cooling and found one that was not being satisfied. We checked the drawings and found that it was a perimeter hall unit that had no connection to the cold air supply. We checked the unit and found that a biotech machine directly under it was dumping heat to the space, but the space was not really uncomfortable. With a couple clicks of the keyboard,

we told the computer that it should ignore calls for cooling from that thermostat.

They had a clean room that needed about 60 air changes per minute of filtered fresh air 24 hours a day. But it did not need to heat or cool that air when there was no one in the space. Guess what? It had been programmed to maintain constant comfort temperatures, even though the space was only used a few hours a day. A switch was added so that the comfort temperatures were only called for when occupied.

These two changes resulted in $5,000 a month in electricity savings.

We do set back!

A very large restaurant asked for help reducing their gas bills. As we toured the building, I asked if they set back the temperatures at night. The manager said, "We sure do!" And he showed me the locked cabinet that held all six programmable thermostats. I ran through the programs and each was programmed to reduce the heating temperatures by 2 degrees from 2 am to 4 am each night. Since they closed for business at 10 pm and do not open until 11 am, I suggested that he change those times to match the closed times and set back to 50 degrees instead.

They were also running the kitchen hood exhausts 24 hours a day. Each hood was matched with its own gas makeup air heater. And both big fireplaces were left on all night. I suggested they shut all of those off at closing. He said, "We can do that?"

They saved $5,000 on the next month's bill, despite colder weather. They saved 20% over the next year.

But the EMS is brand new!

The bowling alley had just put in a new Energy Management System computer to control all the HVAC systems. And now the gas bills had doubled, instead of going down! I asked if they had talked to the guy who programmed it to see what he thought. They said, "I don't like him! I don't even want to talk to him!" That's always a bad sign.

I asked them to scroll down so I could see what the different program features were doing. One was for running the building on a single night thermostat from 11 pm to 6 am. I asked to see where the thermostat was. They showed me a room full of toys with a big double door to the hall, the thermostat on the wall, but curiously, no heating units at all.

I asked how was it heated? They said this is the child care room. They open the big double doors to let in heat during the day and lock the doors closed at night. So, at night the entire heating system was running to try to satisfy a thermostat in an unheated room with the doors closed. I asked what was the temperature like at the bowling lanes first thing in the morning. They said it's always really hot. I suggested they move the location of the thermostat into the hall, so the heating system would be controlled properly.

Inflatable?

The owner of the hot tub store said that this store had the highest bills of all of his 8 stores. At first I thought it would be because of all the hot tubs. But when I got there and saw how well insulated they all were and all covered, that didn't add up.

Then we got the ladder and went up. As soon as my head was above the roofline I could see a problem. The unit was all rounded looking like it was inflated. As we approached it, you could hear all the air hissing out. You could run your hands along all the seams and feel the air blowing out. Just eyeballing it, it looked like about half of the capacity of the fan was going out of those seams, heating the city instead of the store.

I saw the same thing at a post office, but there you could also see the tears in the sheet metal at the corners and the patches and angle iron bracing that had been put on over the years. I suggested to the store owner that he get someone out as soon as possible to see what is plugging the ductwork and get it fixed.

What's going on?

I had just discovered that a year before, our research department had installed a special load research meter on one of my favorite customers. I asked for copies of the 24-hour profiles for one month each from spring, summer, winter and fall.

These were pretty interesting. They showed an average day load of 1,800 kW and a night load of 900 kW. I called the head engineer and asked if he was running all their fans and pumps all night. He said no, but he would check to see what might be on.

The night guards did a survey. They counted 3,000 PC's left on at night in the 500,000 SF office tower. This accounted for the 900 kW. To save energy, they started a contest. They posted signs in the elevator lobby that if people would shut off enough PC's at night to affect the electric bill, there would be a drawing for free parking in the building for each month, a value of $150. They saved $5,000 the first month!

You found what?!

On a windy 40-degree winter day under a dark overcast sky, the outside air dampers appeared to be full open for the 600,000 SF building. I mentioned that they seemed to be pulling much more air than needed. Sure enough, there was enough minimum outside air for 7500 people, even though they only had 2500 employees.

I suggested that they put in CO2 monitoring and let the EMS control the amount of air based on that. They didn't trust me. The got their health and safety guy involved. He installed CO2 monitoring equipment in the return air of one of the main air handling units. Then they experimented. Eventually they found that they could set the minimum return air setpoint to 0%, and with the dampers fully closed, they still leaked 7% of full capacity and still had far more outside air than they needed. I estimated that they are saving about $100,000 a year.

500 kW Room Fan

The big middle school was closed for the summer. The school district's energy manager and I had just left a school where the entire HVAC system was running so that the custodian's office was cool while she ate lunch. The energy guy said, "Now you will see a well run school. This is my best guy."

On the way in, we stopped at the meter and I timed it. It was running at 500 kW. As we opened the door, you could hear the rumble of the huge air handling unit that ventilated the entire school. Sure enough, it was on. We found the custodian and he right away said, "Don't blame me. The principal made me turn it on so he could have a little air movement in his office." This is one of those "energy efficient" buildings from the 70's with sealed windows and no AC.

I did a quick calculation and told the energy manager that in the first 15 minutes that the fan ran, he was hit with a $2,500 demand charge. And if he kept running it all month, they would pay at least another $5,000 in energy charges. He explained the situation to the principal and offered to pay for a desk fan. The principal said OK. That school alone saved $20,000 that summer compared to the previous summer. The whole school district saved $150,000 overall that summer by making sure all of the schools were similarly shut down that year.

I saw a similarly very expensive AC system at a factory in the maintenance shop. One guy had drilled 12 holes in a 6' length of compressed air hose and hung it above his bench to give him lots of cool air. I calculated that the compressor was using about 20 Hp to supply all that compressed air at a cost of $10,000 a year. And the guy next to him liked it so much, he did the same thing. Neither guy was there when I walked around with the head of maintenance. I suggested he buy them each a desk fan.

Moral of the Stories

Actually go look at everything that is using energy, at least the big things. I find that people seldom do that before I come. They always say that they have been too busy.

Question everything. I always ask, why is that like that? Did you know this had big holes in it? Why is this running? What does this do? They often come out sounding like dumb questions, but so often the people I am walking with don't know either. When they find out, often things are not as they seem.

For a lot of this stuff, I don't have to say anything, or just say, "Look at that!" After a few minutes, people get a feel for what I am looking for and see it for themselves. A lot of it is just common sense.

Very often I find things in dire need of simple maintenance. And when you ask why it was not done, I hear how busy they have been, or short handed or they can't get the budget. When I add up what it is costing, it gives a whole new importance to those maintenance people who can be worth their weight in gold in controlling costs.

Ask about comfort problems. Very often if they show you a place that is too hot or too cold or too drafty, something has gone wrong. And often something that is costing extra. Things seem to normally break in a way that causes extra energy use, not less.

Don’t blame the maintenance staff. It never fails that when I visit a building whose bills are way higher than normal, there is also not enough maintenance staff to keep up.